NATIONAL INSTITUTES OF HEALTH
WARREN GRANT MAGNUSON CLINICAL CENTER
NURSING DEPARTMENT

Standards of Practice: Care of the Patient with Chest Tube/Heimlich Valve

Background Information:

- **Examples of chest tubes and related equipment:**
  - **Standard chest tube:** vinyl or silicone catheter about 50 cm. long and 12-40 Fr. diameter used for pneumothorax or after chest surgery to re-inflate the lungs
  - **Pigtail catheter:** smaller diameter chest tube about 8 Fr. in diameter and used with chronic pneumothorax.
  - **Indwelling pleural catheter**: soft silicone tunneled tube with cuff that conforms to the pleural space. The length of the tube is usually about 24 cm. and the diameter is 15.5 Fr. The end of the tube is connected to a collection chamber, an evacuated plastic bottle. The tube is used to drain fluids associated with a malignant pleural effusion in order to reduce dyspnea. Refer to product insert, "PleurX™ Pleural Catheter: A New Approach to Home Management of Malignant Pleural Effusions," for procedures related to the system.
  - **Heimlich Valve:** small device connected to a chest tube that serves as a water seal chamber with a one way flutter valve allowing passage of fluid and air away from the pleural space without the bulk of a large collection chamber. This valve allows for drainage of purulent discharge while supporting mobility in the patient.
  - **Purpose of the normal saline bottle:** Some emergent events such as the breakage of the collection container require the immediate clamping of the chest tube with a non-toothed padded clamp. If a new collection container is not immediately available, the end of the clamped chest tube may be inserted into a bottle of normal saline and then, the clamp removed to allow air or fluid to escape from the chest tube safely. Once the new collection container is available, the chest tube is clamped and removed from the normal saline bottle, the tip of the chest tube is cleansed with alcohol and then, the chest tube is connected to the new collection container and tubing. The padded clamp is removed from the chest tube.

I. **ASSESSMENT**

A. **Pre-Insertion**

1. Assess patient's breath sounds, vital signs including the apical pulse and rhythm, the presence or absence of neck vein distension or increased pulsation, cyanosis, restlessness, and oxygen saturation.
2. Ensure emergency equipment is available and working:
   a. **In patient's room**
      - suction
      - oxygen

b. **With patient:**
   - ♦ chest tube emergency supplies (kit available through CHS and contents are: Vaseline gauze, gauze dressing, tape (ex: Medipore™ tape), 1/2 liter of NS, sterile gloves, alcohol swabsticks, and a padded non-toothed clamp for chest tube in case of accidental disconnection). Pt. should be transported with emergency supplies based on patient condition and prescriber orders.
   - ♦ suction as ordered (portable suction required when out of room)

c. **On Unit**
   - ♦ an emergency CHS chest tray
   - ♦ extra collection chamber (ex: Pluer-Evac™)
   - ♦ additional chest tubes in same size as patient's, smaller and larger sizes also.

3. Gather personal protective gear such as goggles, gloves, and gowns.
4. Review any lab results such as arterial blood gas, hematocrit, hemoglobin, and platelets

B. **Post-Insertion (maintenance and removal)**

1. Immediately after insertion, assess insertion site, location, tube size, and type.
2. Immediately after insertion and every 4 hours while chest tube is in place assess drainage collection system for:
   a. any air leaks
   b. suction set at ordered level at all times including when transporting the patient, when pt uses bathroom, etc. An order is required before suction is discontinued.
   c. collection chamber is below level of chest.
   d. collection chamber is clear of the bed so that if the bed is lowered, chamber is not crushed
3. Immediately after chest tube insertion and every 4 hours while chest tube is in place, assess tubing for:
   a. patency
   b. free of drainage and kinks
   c. connections taped securely
   d. tubing falls straight to the collection device without dependent loops (coil excess tubing and position flat on bed or chair but do not allow tubing to coil on floor)
4. Immediately after insertion, every 4 hours while chest tube is in place, and immediately after removal of chest tube assess:
   a. level of pain
   b. breath sounds, vital signs and oxygen saturation
   c. drainage (amount, color and consistency)
   d. dressing intactness and drainage at insertion site

e. subcutaneous emphysema

5. At each dressing change and immediately after removal of chest tube, assess chest tube exit site for skin condition (color, presence or absence of inflammation, skin breakdown, and pain)
6. While chest tube is in place and drainage collection system is in use, mark on collection container every 8 hours level of drainage, date, and time.

II. INTERVENTIONS

A. Pre-insertion

1. Instruct the patient and/or family regarding the purpose of the procedure, what to expect, and signs and symptoms to report ex., dyspnea, hemoptysis, increasing pain, and criteria for removal of chest tube.
2. Administer ordered analgesics as needed.

B. Post-Insertion (maintenance and removal)

1. Consult with prescriber regarding chest x-ray after insertion and removal.
2. Position the drainage system in upright position and below level of the heart at all times.
3. Place emergency equipment and supplies in patient's room or on unit (see I.A.2). Patient should be transported with emergency supplies based on condition and prescriber's orders.
4. Confirm that extra drainage collection system and chest tubes are readily available on the unit.
5. Assist patient to reposition every 2 hours.
6. First dressing change will be done by physician. Subsequent dressing changes or reinforcements will be done by nursing every 3 days or more frequently if it becomes soiled, saturated, loose, or as otherwise ordered by prescriber.
7. Utilize dressings and supplies such as petrolatum non-adhering dressing with split gauze 4X4's and Medipore™ tape
8. Only clamp a chest tube momentarily, when:
   a. Changing the chest tube collection system
   b. Assessing for location of air leak as ordered by doctor
   c. Assessing patient's tolerance of chest tube removal per prescriber's order
   d. An accidental disconnection from the collection chamber has occurred

C. Obtain specimen samples for testing as ordered by prescriber by:

1. removing specimen (using needleless system) from sampling port in tubing.
2. removing specimens that cannot be obtained in sufficient quantity through the sampling port following the directions outlined in the product inset. Contact resource persons for assistance as needed (ex: CNS) when using the auto-transfusion bag attachment. (Special note: the autotransfusion bag attachment will only be used for the purpose of specimen collection, not auto-transfusion)

D. In the event of a chest tube emergent event, intervene as indicated below:

1. Accidental partial migration of chest tube
   a. Note if openings of chest tube are visible outside of chest wall.
   b. Quickly apply Vaseline® or petrolatum non-adhering dressing followed by 4 X 4's and occlusive dressing, ex., Medipore™ tape.

c. Assess for negative pressure indicator on collection chamber & the specific pressure in cm ordered by prescriber.
d. Assess patient condition and intervene as indicated, ex., for SOB elevate HOB, initiate oxygen therapy, etc.
e. Notify prescriber immediately of event, interventions, and patient condition.
f. Obtain prescriber orders for chest x-rays.

2. In the event of total chest tube accidental pullout
   a. Quickly apply Vaseline® or petrolatum non-adhering dressing followed by 4 X 4's and occlusive dressing, ex., Medipore™ tape.
   b. Assess patient condition and intervene as indicated, ex., for SOB elevate HOB, initiate oxygen therapy, etc.
   c. Notify prescriber immediately of event, interventions, and patient condition.
   d. Obtain prescriber orders for chest x-rays.
   e. Assist with new chest tube insertion if indicated
3. In the event of chest tube collection chamber accidental breakage with an intact chest tube:
   a. Briefly clamp chest tube with clamp on connecting tube
   b. Verify tubing is clamped securely and disconnect tubing below clamp in order to change the damaged collection chamber
   c. Cleanse end of tubing with alcohol at the connection site.
   d. Connect new tubing and collection chamber to chest tube.
   e. Unclamp chest tube. (Have another nurse verify system unclamped)
   f. Connect suction as ordered
   g. Verify that collection chamber has negative pressure on indicator and cm pressure reading is as ordered by prescriber.
   h. Notify prescriber of event, patient condition, and interventions.
4. For connection of chest tubes to Heimlich valves
   a. Obtain Heimlich valve from CHS. Keep several extra Heimlich valves on unit.
   b. For first application, the physician will clamp chest tube briefly, disconnect old collection drainage system, connect Heimlich valve, then remove clamp from chest tube. Verify that Heimlich valve is attached such that the flow arrow points away from the chest tube.
   c. Nurse can now connect vented urinary leg bag to Heimlich valve. (CAUTION: only use the vented urinary bag system as the air passing through the Heimlich valve must be allowed to vent out to the atmosphere to prevent a pneumothorax).

III. **DOCUMENTATION**

A. Document in approved Medical Records form or computerized charting system.
B. Document assessments and interventions including:
   1. Chest tube size and insertion site
   2. Date and time of tube insertion
   3. Name of person who inserted the tube
   4. Drainage amount, color, and consistency
   5. Patient tolerance of procedure
   6. The date and time the post procedure chest X-ray was done

7. Patient teaching

IV. **REFERENCES**

A. Bucher, L. & Melander, S. (1999). Critical Care Nursing, W.B. Saunders, chapter 19, Common Respiratory Problems, pp. 488-496.
B. Carroll, P. (1995). "Chest Tubes made easy". RN, December. pp. 46 -55.
C. Gordon, P.A., Norton, J.M. & Merrell, R. (1995). Refining Chest Tube Management: Analysis of the State of Practice, Dimensions of Critical CareNursing. 14 (1), pp. 6 -12.
D. Hanlon, M. & Lochbaum, L. (2001). Options in Practice, JWOCN, Volume 28, Number 6, pp. 314-316.
E. Kinney, M. R. et. al. (1998). AACN's Clinical Reference for Critical Care Nursing, 4th edition, Mosby C. St. Louis, Clinical Pathways: Thoracotomy. Pp.
F. Kozier, B. & Erb, G. Eds. (1993). "Monitoring a Client with Chest Drainage". Techniques in Clinical Nursing. pp. 817 -821.
G. Lazzara, D. (2002). Nursing 2002, Eliminate the Air of Mystery from Chest Tubes, Vol. 32, Number 6, pp. 36-43.
H. O'Hanlon-Nichols. "Clinical Savvy: commonly asked questions about chest tubes". American Journal of Nursing. May 1996. 96, pp. 60-64.
I. "PleurX™ Pleural Catheter, a new approach to home management of malignant pleural effusions." Springhouse Corporation (1991). "Chest Drainage", Procedures Video Series. Springhouse PA.
J. http://search.msn.com/results.asp?q=nursing+care+of+chest+tubes& 2002, Pulmonary Concepts in Critical Care: Care of the Patient with Chest tubes, pp 1-2
K. http://www.nursewebsearch.com/Specialties/Critical_Care/ (October 2002).

Approved:

_____

Clare E. Hastings, RN, Ph.D.
Chief, Nursing and Patient Care Services

Formulated: 10/97
Implemented: 12/97
Revised: 8/02; 11/02
Reviewed: 6/00, no changes required 6/02
G:\SOP\Chestube.doc
CIS/10/24/00